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Assessment of environmental indicators on the topolithosequence with a particular reference to soil development in south Sulawesi, Indonesia

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Abstract: A study was carried out to assess environmental indicators and to investigate the role of soil mineralogy on the topolithosequence with a particular reference to soil development in South Sulawesi, Indonesia. Soil profiles were selected based on the differences in altitude, slope gradient, and rock unit. The soil profiles can be respectively described as follows: P1 (140 meters above sea level, 20%, breksi and lava); P2 (60 meters above sea level, 15%, sedimentary rock); P3 (20 meters above sea level, 3%, alluvium sediment), and P4 (5 meters above sea level, 0%, alluvium sediment). In the identification of sand fraction mineral for each profile, minerals such as Garnet, Apatite, Olivine, Hornblende, Biotite, Feldspar, Muscovite, Quartz, Hematite, and Pyrite were found. The quartz mineral can be used as a topolithosequence indicators regarding soil development and its vulnerability against pedo-transfer functions. According to soil development, the profiles can be arranged as follow: P4 > P3 >P2 > P1. The X-ray diffractogram analysis of soil profiles indicates that the diffractogram peaks are 3.2; 3.4; 3.56; 9.9; 12.4; 14.5; 15.4; 16.8; and 17.7A° which are identified as montmorillonite clay mineral, and the diffractogram peaks 7.2 and 10.1A° are halloysite. Meanwhile, the diffractogram peaks 3.58, 3.59, and 7.15 A° are identified as kaolinite. Each soil profile with its diffractogram peak signifies that all profiles have clay mineral montmorillonite, halloysite, and kaolinite, except for soil profile P1 only which has montmorillonite, and halloysite. Therefore, it could be concluded that P1 has experienced longer weathering than P2, P3, and P4, although it never leads to a soil development. The overall results of both sand fraction minerals and clay minerals signify that the soil development rate of each profile corresponds to altitude and slope. This eventually indicates that the weathering is transported in its lateral translocation nature, and reveals different types and levels of environmental indicators related to soil development.

Keywords: Environmental Indicators, Pedo-Transfer, Soil Development, Topolithosequence, Weathering.